

SOCIAL INTERACTION IN LEARNING FROM THE STANDPOINT OF PHYSICS REVIEW OF STUDIES RELEVANT TO NON-PERCEPTUAL INTERACTION

IGOR VAL. DANILOV

Academician, Academic Center for Coherent Intelligence, Rome, Italy

ABSTRACT

From the standpoint of Newton physics, there are four possible domains of perceptual social interaction, this article shows that interaction between social beings with nervous system can also occur through non-perceptual mental collaboration, based on quantum mechanics laws. The review attempts to understand the origins of social interaction, approaching to this issue from different science and also from the viewpoint of physics. The study investigates non-perceptual social interaction, which is the origin of social interaction, since in the absence and/or before of any perceptual interaction, it can "teach" new members of a social group the initial social phenomena: how to behave socially. Thus social collaboration of different social beings was observed through findings of different studies – in (a) behavior of social insects, (b) social behavior of human fetus, and (c) social behavior of 3- to 4-month-old infants – where an increase of the group performance proceeded without perceptual communication between the subjects. The review also considers studies on the quantum entanglement from quantum mechanics. The hypothesis supposes that non-perceptual social interaction can manifest itself in groups of all social beings with nervous system, it permeates all social relationships, pushes meaningful communication and accompanies it throughout life. The latest study by Danilov et al. (2019) on language acquisition of adults supported this conclusion showing the increase of group performance provided by such unconscious mental collaboration. The long-term study of non-perceptual social interaction can form the basis of the advanced curriculum that can facilitate and accelerate learning of students. The study supports the theory of Coherent intelligence that attempts to systematically introduce the notion of non-perceptual social interaction within the framework of existing laws of physics.

KEYWORDS: *Implicit Memory, Unconscious Thinking, Interpersonal Perception, Socialization, Coherent Intelligence, Collective Intelligence & Non-Perceptual Social Interaction*

Received: Nov 22, 2019; **Accepted:** Dec 12, 2019; **Published:** Jan 13, 2020; **Paper Id.:** IJCMSFEB20203

INTRODUCTION

The notion of social interaction was introduced by sociology studying the effect of social actions. This review has not found any study that was aimed to explore the origins and/or mechanism of social interaction, while this collaboration should be observed from the standpoint of various Sciences, since it forms social processes all macro- and micro-levels, from constituting society to developing knowledge. Deeper knowledge on social interaction can also help to better understand the formation of social reality in mind. Social animals from insects to human beings understand their social reality, the issue of how new members (e.g. neonates) can acquire the initial social phenomena before any communication with their reference social group takes part in many long interaction, while this colls and reflects by the numerous concepts from the fetal awareness to the first language acquisition by infants. The phenomenon from everyday life that is routine and mundane for all of us, if it exists, then it should be visible from and can manifest itself through different sciences. Thus, various studies on different issues from the

behavior of social insects and social psychology to quantum physics has been observed to find evidence of unconscious mental collaboration between social beings. The current review aims to study origins of social interaction observing findings of different studies – in (a) behavior of social insects, (b) social behavior of human fetus, (c) social behavior of 3- to 4-month-old infants, – where an increase of the group performance proceeded without perceptual communication between the subjects. The review also considers studies on the quantum entanglement from quantum mechanics.

From the standpoint of Newton Physics, there are four possible domains of perceptual social interaction, Danilov & Mihailova (2019) argued: 'Social interaction constructs social reality, engaging a wide range of mental tasks of participants through various conscious and unconscious manifestations, which can be meaningful or meaningless. There are 4 possible domains of perceptual social interaction: (i) conscious meaningless interaction – conscious priming-sensitivity exchange; (ii) unconscious meaningless interaction - unconscious priming-sensitivity exchange; (iii) conscious meaningful interaction – conscious verbal and nonverbal communication; and (iv) unconscious meaningful interaction ful interaction tructs social reality, engaging a Danilov & Mihailova, 2019).' Particularly they are:

- Conscious meaningless interaction is a conscious exchange of symbols which do not have mutually intended meanings for the parties of this exchange. Thus, a conscious priming from the one side meets with a conscious sensitivity from the other side without informational exchange. One example of such interaction is the vocal conversation via telephone of representatives of different cultures, their misunderstanding is due to the fact that they speak different languages and do not see each other. Its overcome is the awareness of all participants in the development of their mental states without informational exchange between them.
- Unconscious meaningless interaction is an unconscious exchange of symbols which do not have mutually intended meanings for the parties of this exchange. Thus, an unconscious priming from the one side meets with a conscious (or unconscious) sensitivity from the other side without informational exchange. One example of such unconscious interaction is the encounter of persons from different cultures, their misunderstanding occurs from different meanings of their body language. The overcome of this interaction is the development of mental states of all participants without informational exchange between them and without their awareness of such development.
- Conscious meaningful interaction is the conscious exchange of symbols with mutually intended meanings. It is conscious part of verbal and nonverbal communication, the informational exchange with its awareness.
- Unconscious meaningful interaction is the unconscious exchange of symbols with mutually intended meanings: unconscious part of verbal and nonverbal communication. This is interaction without its awareness, which happens with the informational exchange and development of mental states of participants.

This study attempts to show that interaction of social beings with nervous system can also occur through non-perceptual interaction, based on quantum mechanics laws. The review investigates non-perceptual social interaction, which is the origin of social interaction, since in the absence and/or before of any perceptual interaction, it can "teach" new members of a social group the initial social phenomena: how to behave socially. It occurs before any communication and accompanies social beings throughout their lives, manifesting in different social behaviors of different animal species. The latest study by Danilov & Mihailova (2019) on social behavior of infants as well as the

experiments by Danilov et al. (2019) on language acquisition of adults supported this conclusion showing the increase of group performance provided by such unconscious mental collaboration. The review attempts to substantiate that facilitating of decision making in a group – which appears in groups of all living creatures with nervous system from worms and colonies of bees and ants to people – is the overcome of non-perceptual social interaction. One possible explanation for this social interaction, based on the existing laws of physics, was introduced by Igor Val. Danilov (2019, p.109) in the theory of Coherent intelligence: 'Coherent Intelligence is an effect of unconscious collaboration provided by interconnection of many brains united by entanglement state of their neurons – the phenomenon of quantum entanglement of particles – which is stimulated by common emotional arousal. This connection of entangled neurons may unite neural chains of different cerebrums and maintain their coherent mental process.' This theory supposes that the phenomenon emerges from collaboration of many individuals if they solve an important problem for them at the same time within the framework of single emotional stimulation (Danilov, 2019).

SOCIAL BEHAVIOR OF LIVING BEINGS

Social Insects

Facilitating of decision making in a group appears in groups of living creatures with nervous system such as worms and in colonies of social insects like bees and ants. Earthworms communicate and influence each other's behavior. The worms collectively decide to travel in the same direction as part of a single herd. The discovery suggests that earth-worms are social animals, and their group behavior is similar to the herding or swarming of other species. (Zirbes et al., 2010)

The experiments with beehives and anthills present that the whole is greater than the sum of its parts. 'Bees and ants jointly choose places for new nests based on the feeling of the quorum, that is, they do not obey the decision of one or several leaders, but act together.' (Sumpter & Pratt, 2009) It was unknown how do they perceptually interact each other, taking in account that just 10 per cent of their colony are scouts and each of these lone seekers visited only one-two places before the whole colony of thousands creatures make a decision together.

Human Fetus

The fact of an acceleration of fetus twins' physical and neurological maturity in respect of single embryos in the 14–18 weeks period (Castiello et al., 2010) leads to discuss about an influence of social interaction on thinking and raises another question of how fetuses can distinguish each other from the environment without the meanings of the "I" and "Other". Furthermore, other-directed actions of twins are predominant over self-directed actions, given that fetuses start to socialize before their eyelids can finally open, and eyes are about as fully formed when he or she hits the 26th week. Danilov et al. (2019) argued: '(1) either twin fetuses can understand the meanings of one of twins are pre or their interaction is non-perceptual and unconscious. (2) Infants are born socialized also in the absence of communication with other members. Their socialization cannot only be explained by known perceptual social interaction. (Danilov et al., 2019).'

The 3 to 4 Month Old Infants

Understanding of social reality manifests itself through social behavior, one of the main social skill is language. Numerous studies have begun to examine the social behavior of infants through words categorization over the past 30 years. 'Acquisition of knowledge mainly based on discovery of new key relationships between cause and effect within prior knowledge, and/or on the opening links between elements of prior knowledge and new information domain. This means that the acquisition of initial words also requires infants to demonstrate some basic knowledge on the social reality around

– specific basic knowledge of their particular group, considering the existence of about 6,000 languages in even more groups and communities, all with their unique social reality – as well as needs efficient communication which is a reciprocal exchange of mutually intended meanings (Danilov & Michailova, 2019).' It is still unknown how newborns acquire meanings of initial social phenomena. The issue of prior knowledge is still a focus of discussions. Ferry et al. (2010) and then Perszyk & Waxman (2019) found that 3- to 4-months-old infants already can categorize words. Danilov & Mihailova (2019) questioning their main conclusion that young infants may categorize words themselves. Obviously, that young infants have to begin language categorization even before they initiate to develop their non-verbal communication, which only occurs since 12-months of age, because they need to already understand social reality with a minimum set of its phenomena before any communication. The current study assumes some mental collaboration between infants and their caregivers that helps young infants to acquire first language and the manifestation of which occurs in these experiments with young infants. Non-perceptual social interaction between pairs infants and caregivers (or supervisors) may be the possible explanation of their performance, due to the fact that experimenters excluded any perceptual interaction with infants that could help them improve their performance (Danilov & Mihailova, 2019).'

STUDIES RELEVANT TO QUANTUM ENTANGLEMENT

The recent findings in different studies of quantum mechanics support theoretical arguments of non-perceptual social interaction that is 'an effect of unconscious collaboration provided by interconnection of many brains united by entanglement state of their neurons – the phenomenon of quantum entanglement of particles – which is stimulated by common emotional arousal This connection of entangled neurons may unite neural chains of different cerebrums and maintain their coherent mental process (Danilov, 2019).'

- Recent research presents possibility to entangle particles with a size the same as neurons have, researchers have entangled 15-micrometer-long particles. Two separate teams led by Physicist Mika Sillanpää and physicist Sung kun Hong reported in April 2018 their results (Sillanpää & Hong, 2018)
- The phenomenon of quantum entanglement of particles appears also online due to the fact that the entangled state of the neurons does not depend on a distance between them. Recent study tested quantum entanglement over unprecedented distances, beaming entangled pairs of photons to three ground stations across China—each separated by more than 1200 kilometers. 'Yin et al. used the Micius satellite, which was launched last year and is equipped with a specialized quantum optical payload. They successfully demonstrated the satellite-based entanglement distribution to receiver stations separated by more than 1200 km (Yin, et al., 2017).'
- Living cells also can be entangled. Recent study presents that living sulphur bacteria interacting with quantized light. Researchers show that 'the strong coupling between the bacteria and the light, when both are treated quantum mechanically, indicates that in those experiments there is entanglement between the bacteria (modelled as dipoles) and the quantized light (modeled as a single quantum harmonic oscillator) (Marlettoet. al., 2018).'

DISCUSSIONS AND CONCLUSIONS

One of the reasons why the review observed these different studies is that all acts of collaboration of subjects in them proceeded without perceptual interaction, thus in a such way it is possible to eliminate from the observation any already known communication between subject that could help them to behave socially and improve their performance. The author believes that the question of the origins of social beings collaboration relies on emotional contagion. Emotional contagion

is probably most ancient interaction and only one possible stimulus for such non-perceptual interaction that occurs for all social beings. It is also one of the common features for all living beings with nervous system given that with it they may somehow ensure collaboration, in the absence and/or before communication. Strong emotional arousal in a vital and extreme situation for social beings with the common and unified task within the frame of the extreme situation can make possible collaboration within their groups. Important to note that the result of research on insects assumes that they also have emotions (Batesonet. al., 2011). Researchers argued that agitated honeybees exhibit pessimistic cognitive biases: 'Whether animals experience human-like emotions is controversial and of immense societal concern. The next reason is that animals cannot provide subjective reports of how they feel, emotional state can only be inferred using physiological, cognitive, and behavioral measures. In humans, negative feelings are reliably correlated with pessimistic cognitive biases, defined as the increased expectation of bad outcomes. Recently, mammals and birds with poor welfare have also been found to display pessimistic-like decision making, but cognitive biases have not thus far been explored in invertebrates (Batesonet. al., 2011).'

The study on language acquisition in adults under the condition of the absence of any perceptual interaction between subjects was conducted at the Riga Stradina University of Latvia during 2018-2019 years. The multiple-choice test with within-subject design required participants to simultaneously guess the English translation of Latin paraphrases. The experiments examined how accurately the group of unprimed participants (who did not speak Latin language) could classify Latin phrases, contrasting their performance between two conditions for confederates: unprimed or primed with hints regarding the correct answer. The experiments adhered to two research paradigms: (1) the two-step experiment with the primed and unprimed conditions for confederates with the same questionnaire in both steps, that confederates and unprimed participants had to take twice as a repetition task, and (2) the experiment with the unprimed condition during the baseline and primed condition in experimental testing, that primed confederates and unprimed participants had to complete one questionnaire with baseline and testing tasks. The study under the paradigm 1 conducted three experiments with forty six adults (mean age $M=18$ years). The correct answers were calculated only for the unprimed participants. The 1st paradigm experiments showed the ratio of $R(1)=1.68$, that is, an increase of performance was 21 percentage points. This result is 5.7 times higher than random choice (the score $S(1|2)=0.57$, and the probability $P(1|2)=0.1$). The experiment under the paradigm 2 was conducted with eleven adults (mean age $M=18$ years). The ratio of $R(2)=1.56$ was presented, that is, the productivity gain was 9 percentage points. The 2nd paradigm result is 2.5 times higher than random choice (the score $S(2|2)=0.25$, and the probability $P(2|2)=0.1$). The study by Danilov et al. (2019) shows a significant increase of performance of the unprimed participants (the ratio of correct answers $R(1)=1.68$ and $R(2)=1.56$) between primed and unprimed conditions of confederates. This empirical evidence for the effect of non-perceptual social interaction on group outcome was presented at the 12th annual International Conference of Education, Research and Innovation Seville on November, 2019. The study shows that non-perceptual social interaction is an unconscious exchange of mental states of participants with low outcome of such informational exchange, it is less effective than communication, comparing their possible results. But, as the author believes, the core role of non-perceptual social interaction in the evolution of nature and/or in the individual development of living beings is that it can appear before communication and may contribute, for example, to a development of social skills in newborns such as understanding of social reality, recognition of faces, and then, the first language acquisition. It does not engage five basic human senses and does not require participants understand the context of interaction, proceeding without an awareness of participants that interaction happens. Danilov (2019) supposes that the phenomenon emerges from collective efforts if: (i) participants experience the same emotional arousal; (ii) they simultaneously solve the problem, which is

important for them, within the framework of this emotional stimulation. The long-term study of non-perceptual social interaction can form the basis of the advanced curriculum that can facilitate and accelerate learning of students. The study supports the theory of Coherent intelligence that attempts to systematically introduce the notion of non-perceptual social interaction within the framework of existing laws of physics.

ACKNOWLEDGEMENTS

The author thanks Dr. Sandra Mihailova for her help preparing this review.

Declaration of Conflicting Interests

The author declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

REFERENCES

1. Bateson, M., et al., (2011) *Agitated honeybees exhibit pessimistic cognitive biases*. [Online] Available from: <https://www.ncbi.nlm.nih.gov/pubmed/21636277> [Accessed 16 May 2018], *Curr Biol.* 2011 Jun 21;21(12):1070-3. doi:10.1016/j.cub.2011.05.017. , 2011.
2. Castiello U., et al. (2010) *Wired to be social: the ontogeny of human interaction*. *PLoS ONE* 5(10): e13199. doi:10.1371/journal.pone.0013199.
3. Danilov I. Val. (2019) *Unconscious Social Interaction: Coherent Intelligence. Second edition complemented*. [e-book]. Retrieved from <https://www.amazon.com>
4. Danilov I. Val., & Michailova S. (2019) *Social interaction shapes infants' earliest links between language and cognition*. (in press).
5. Danilov, I. Val., et al., (2019) *Interdisciplinary review on 6 concepts relevant to non-perceptual social interaction*. (in press).
6. Ferry A. L., Hespos S. J., Waxman S. R. (2010). *Categorization in 3- and 4-Month-Old Infants: An Advantage of Words Over Tones*. *Society for Research in Child Development, Inc.*, <https://doi.org/10.1111/j.1467-8624.2009.01408.x>
7. Marletto, et. al. (2018) *Entanglement between living bacteria and quantized light witnessed by Rabi splitting*. *Journal of Physics Communications*. October 10, 2018: Available from: <http://iopscience.iop.org/article/10.1088/2399-6528/aae224/meta> [Accessed 22 January 2019]
8. Perszyk D. R. & Waxman S. R. (2019) *Infantson's entanglement between living bacteria and quantized light witnessed by Rabi splitting*. *Journal of Physics Communications*. October 10, 2018: Available from: <http://iopscience.iop.org/article/10.1088/2399-6528/aae224/meta>
9. Sillanp D. R. & Waxman S. R. (2019) *Infant's advances in speech goes big in new experiments*. [Online] *Science News* 25 April 2018. Available from: <https://www.sciencenews.org/article/spooky-quantum-entanglement-goes-big-new-experiments> [Accessed 25 May 2018]
10. Sumpter, David J. T. and Pratt, Stephen C. (2009) *Quorum responses and consensus decision making*. *Philosophical Transactions of the Royal Society B. l Society B. . ty B. nt-goes-big-new-experiments* [Accesserstb.2008.0204.
11. Yin J., et al. (2017) *Satellite-based entanglement distribution over 1200 kilometers* [Online] *Science*: Vol. 356, Issue6343, pp. 1140-1144, DOI: 10.1126/science. aan3211, 16 Jun 2017 Available from: <http://science.sciencemag.org/content/356/6343/1140> [Accessed 16 May 2018]
12. Zirbes, L., et. al. (2010) *A New Case of Consensual Decision: Collective Movement in Earthworms*. [Online] *Ethology. International journal of behavioral biology*. February 8, 2010: doi: 10.1111/j.1439-0310.2010.01768 Available from: <https://doi.org/10.1111/j.1439-0310.2010.01768>

https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1439-0310.2010.01768.x?referrer_access_token=Z-ZlPdUtV9I2PQ-wly9FZf4ta6bR2k8jH0KrdpFOxC64GyH0EsUtE9zs6Wbjf_xDkVscba8sJrLlbsK5g3rxR7IKGuj4cWn5ggp22DuMdQ-ZM0cmjYaYlYLO843pGFD0u3PDXHR_ehV4vecfQe0XCeg%3D%3D [Accessed 2 December 2018]

AUTHOR PROFILE



Igor Val. Danilov, is an academician at the Academy Angelica Constantine of Rome, physicist and researcher in quantum physics, specialist in communication. Academic background: Engineering physics, Education and Media management, Academician. He started the undergraduate program at the 'LETI University' (Leningrad, USSR) in 1984, where he studied Physics and graduated from the 'LETI University' (Saint Petersburg, Russia) in 1992 with the postgraduate diploma in the Engineering physics: 'the researcher of Earth from Space'. In November 2013 he was awarded the title of academician of the 'Academy Angelica Constantine' of Rome. He is currently working at the research center 'Academic Center for Coherent Intelligence' in Rome-Riga.

